Brookhaven National Laboratory

SNS

Ring and Transfer Lines Systems

M A R C H

MONTHLY REPORT

01 March – 31 March 2002

Performing Organization:	Brookhaven Science Associates
Location:	Brookhaven National Laboratory Upton, New York 11973-5000
Contract Period:	October 1998 – June 2006

Brookhaven National Laboratory
SNS MONTHLY PROGRESS REPORT
March 2002
Ring and Transfer Lines Systems

I. Senior Team Leader Assessment

1. TECHNICAL PROGRESS AND ACCOMPLISHMENTS

- Good progress is continually made in reducing the field variation of the ring dipole magnets. After shimming, eight magnets have been fully measured, all meeting design goal of 0.01%. This is up to a factor of 20 reductions from the previous pre-shimming values.

- In coordination with ORNL's effort to alleviate the impact of RTBT-Target flight-tube aperture limitation, the RTBT collimators are re-located to optimize the acceptance.

- Luminescence Monitor is identified as a promising candidate for beam profile measurement, especially in the presence of anticipated electron-cloud in the ring. BNL's C-AD has provided full cooperation to test the device at AGS in June, and tunnel access is planned in April 2002 for installation.

- Ring collimator location, geometry, and dimension are finalized.

- Extraction kickers are re-positioned to maximize the efficiency.

- New SNS/Ring organization chart is released; Larry Hoff will become controls group leader upon May 2002.

2. ISSUES AND ACTIONS

- None.

3. COST AND SCHEDULE STATUS

3.1 VARIANCE ANALYSIS AND PROJECT COST PERFORMANCE REPORTS

WBS 1.1.3 R&D

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
5068.2	5068.2	5083.3	0.00	0.0%	(15.1)	-0.3%

Variance Statement: Variances are within thresholds. No analysis required.

Project Impact: None.

Corrective Action: None.

WBS 1.5 Ring and Transfer Lines

BCWS	BCWP	ACWP	SV	%	CV	%
46287.6	46433.2	46140.4	145.59	0.3%	292.8	0.6%

Variance Statement: Variances are within thresholds. No analysis required.

Project Impact: None.

Corrective Action: None

3.2 MILESTONE STATUS

WBS 1.5 and 1.1.3 have no level 0 milestones. Milestone status is listed below.

Milestones	Level 1	Level 2	Level 3	Level 4	Level 5
Project	0	1	3	13	129
FY02	0	0	0	0	28
Due in Next 30 days	0	0	0	0	1
Total Due at present	0	0	3	12	99
Made	0	0	3	12	86
Missed	0	0	0	1	13
Ahead of Schedule	0	0	0	0	0

3.3 PROJECT CRITICAL PATH ANALYSIS

The critical path items for the Ring are the Ring Sextupole magnet, followed by the BCM.

II. Detail R&D Subproject Status

WBS 1.1.3 – Ring System Development

All work covered by R&D funds is essentially complete.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
5068.2	5068.2	5083.3	0.00	0.0%	(15.1)	-0.3%

Variance Statement: Variances are within thresholds. No analysis required.

Project Impact: None.

Corrective Action: None.

III. Detail Line Item Subproject Status

WBS 1.5.1 – HEBT Systems

Phone conferences continued with Tesla during the month on the HEBT dipole magnet. Tesla shipped the second and third dipole magnets. They are somewhere on the high seas.

Phone conferences continued with Danfysik during the month. Both the 12Q45 quadrupole magnet and the 16CD20 corrector magnet were received at ORNL. Both magnets have been inspected. Two concerns were the depth of the fiducial counter bore (which is being revised) and the location of the klixons on the corrector (which was not to print). The 12Q45 is being magnet measured. While Danfysik has not been given approval for production but they are proceeding with winding the coils for the 12Q45.

One standard production dipole chambers was test-fitted into a production magnet and found to have "1/2 inch" bow in the chamber vertical plane. It was decided to capture the chamber by lowering the upper pole after positioning the chamber on the lower pole. The special extraction dipole chambers and injection dipole chamber (4 total) have been received, uncrated, inspected for visual damage and leak checked. They will be dimensionally inspected with the laser tracker. With the new lattice positioning system, the exit pipe of the momentum dipole chamber was found to have scrapping with the 1.0 GeV +0.66% rays. New analysis will be performed to determine the acceptance limitation on scrapping.

All 12 cm quadrupole beam pipe drawings have been released. Orders for pump tees and foil stripper tees will be processed. Design of welding fixture for 21 cm quadrupole chambers has restarted. Detail design of the 21 cm magnet and ion pump stand is underway and is been coordinated with that of RTBT to generate a common design.

Drawings for the truncated HEBT line collimators have being prepared, and will undergo internal review. Conceptual drawings of the HEBT momentum dump are still in preparation.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
4231.0	4060.0	3822.3	(171.01)	-4.0%	237.7	5.9%

Variance Statement: Variances are within thresholds. No analysis required.

Current period schedule variance (SV) -$190.6K (-49%) is driven by WBS 1.5.1.5.2 HEBT Collimator 1st delivery whereas a PCR will be processed to show planned delivery in March '03 thus adjusting SV.

Project Impact: None.

Corrective Action: None.

WBS 1.5.2 – Injection Systems

The drawings for the first three injection chicane magnets have been checked. However - the physics parameters for the first chicane magnet were revised during the month and the magnet will have to be redesigned. Another core shape analysis for the revised magnet is underway.

The time step analysis to determine the heating of the carbon/carbon block for stripped electron capture over the injection time period and repetition rate was done with both ANSYS and ALGOR by two different engineers to compare results. Also testing was done with an electron beam welding to determine the limits of the carbon/carbon material. During the month a design review was held with ORNL participation that presented both the analysis and experimental results. The carbon/carbon absorber design will meet the requirements of the injection area. The remaining concern is heating of the adjacent area. Further analysis of that will be done.

The assembly of the injection septum magnet will be moved to another building because of space and manpower availability. The vacuum chamber still remains to be completed by the shops.

The drawings for the redesigned dump septum magnet have been checked and will be forwarded for approval when completed.

The assembly of the two first article long injection kicker magnets (horizontal and vertical) was completed. Jumper bus bars are all installed. Based on W. Eng's schedule, the kicker power supply will be delivered sometime in April. Right now he is preparing to do measurements of the inductance and resistance of the magnet and coil. An updated quote for second phase PO was received from Everson that has the revised short magnet coil (6 turns) and jumpers. A PO change is being prepared. Once the drawings of short magnet coil are finalized the PO will be released. The coil and ferrite drawings of short magnet are being checked for release. The supports for coil connectors and power cable need to be modified slightly to accommodate the bending radius of the power cable. The stand design is being modified also. Ceramaseal has again revised the delivery date for the ceramic chambers to 5/8/02. Problems machining the ceramic beam tube are blamed for the delay.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
3341.4	3493.4	3505.8	151.95	4.5%	(12.4%)	-0.4%

Variance Statement: Cum Variances are within thresholds. No analysis required.

Current period cost variance (CV) $43.8K (29.5%) is driven by WBS 1.5.2.3 D.C. magnets, whereas material BCWP is greater than the current period ACWP and 1.5.2.5 Stripped Foil, whereas labor BCWP is greater than current period costs variances will net out in cum in subsequent periods.

Project Impact: None.

Corrective Action: None.

WBS 1.5.3 – Magnet Systems

Sixteen-ring dipole magnets (17D120) have been measured so far; many of them twice. All of the magnets in that group that require shimming have been shimmed (12 of 16). At this time there are eight good magnets (ITF that is $<1 \times 10^{-4}$ from the nominal value) that have been fully measured and approved. An engineering review of the progress of the shimming and measuring of the dipoles was held with the ORNL engineering staff during the month. Also discussed was the overall production schedule for the half cell assemblies.

An automatic transverse drive mechanism on the dipole coil measuring station is being assembled and tested to eliminate manual adjustments for each transverse step. Measurements utilizing this drive mechanism will begin the first week in April.

Phone conferences continued with Tesla during the month on the 21Q40 quadrupole magnet. The first production four magnets were received and inspection of the magnets is underway. At the end of the month one of the magnets was being surveyed into the 1st article measurement fixture.

Parts for the 21 cm magnet measurement station are being fabricated and should be completed next month. The 21 cm measurement coil has been wound. In order to keep on schedule the 21 cm production facility will be built in a separate area. The original plan was to use the dipole measurement facility after the dipoles were completed but the shimming effort has caused an overlap in the schedules. The goal is to set-up the production area by the end of April.

Both half cell-lifting fixtures for the ring has been successfully load tested and approved for use. During a review, the ORNL engineering staff requested changes to the design that would use tie bars instead of slings. An alternate design will be worked on and a cost estimate for this change generated.

The first production group of seven 27CDM30 correctors was tested and accepted and the first article was successfully magnet measured. Danfysik has been given approval for production and has shipped a second batch of seven magnets.

New England Technicoil reworked and returned the first article 21CS26 sextupole corrector magnet that was rejected because it was out of tolerance. It was inspected and passed magnet measurement. Production of the second 21CO26 is underway and it is scheduled to be shipped by 4/5/02.

Phone conferences were held with Budker Institute of Nuclear Physics (BINP). A second pole tip was received and it was found to be slightly out of tolerance though BINP disputes the results. Regardless, the discrepancy is small enough that it will not affect the magnet field quality if the poles are properly aligned. BINP has been given a go ahead and production of the 1st article is underway. BINP has sent photographs that show machining of components and winding of the first coil. The quality of the winding coil fixture is excellent. Their progress at this time is very good. BINP is in the process of sending invoices for the steel, the pole tip, the schedule, and the coil samples worth about $41K.

Alpha Magnetics has ordered material for the 41CDM30. Delivery of the first article is scheduled for 5/22/02.

The bids for the 36CDM30 corrector magnet were received and the order has been placed with New England Technicoil, the low bidder.

The detailed design drawings for the 21S26 high field sextupole have been checked and are in the approval cycle. The bid package will be sent out next month.

A design review for the 26S26 high field sextupole was held with the ORNL engineering team. There were no issues and detailed design is underway.

Work continues on the BNL/SNS magnet parameter list to include the latest design and physics information. All four levels of magnet development (designer, engineer, magnetic field analysis, and physics parameters) are being reviewed and compared for correct information. The physics group is still reviewing it. A review of BNL's plans for installation drawings was held with the ORNL engineering team. There were no issues other than ORNL wants the drawings now and this effort is barely underway.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
8705.5	8540.0	8628.2	(165.43)	-1.9%	(88.1)	-1.0%

Variance Statement: Cum Variances are within thresholds. No analysis required.
Current period schedule variance (SV) $83.8K (35.9%) is driven by 21Q40 Magnet production delivery Phase 1, WBS whereas performance was taken against prior month BCWS of $117.5K and is net zero in cum period. Current period cost variance (CV) $84.6K (26.7%) is driven by material BCWP ($117K) of 21Q40 Magnets, WBS whereas actual costs have not been expensed against material BCWP. Current period cost variances will net out in cum in subsequent periods.

Project Impact: None.

Corrective Action: None.

WBS 1.5.4 – Power Supply Systems

The design review data presented for the first six medium range power supply models in February at the vendor's facility in February was transmitted electronically in March for the second six medium range models. Because of the similarity in design, this review was able to be conducted without a physical visit.

Final acceptance testing has been scheduled for April 25th for the injection bump power supply. Prior to this visit, the vendor will provide complete acceptance test data.

Two low field correction prototypes were shipped to BNL for further testing. This allows us to perform more extensive testing than was possible at the vendor's facility. Testing will continue into April. The specification for the RF Tuning power supply was written in March. The RFQ will be released to vendors in mid-April for a May award.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
879.8	882.0	883.6	2.24	0.3%	(1.6)	-0.2%

Variance Statement: Variances are within thresholds. No analysis required.

Project Impact: None.

Corrective Action: None.

WBS 1.5.5 – Ring Vacuum System

Three Type C halfcell chambers have been welded bringing the total to 21 chambers completed. The 10" BPM support for the welding fixture is complete. The shops have fabricated fifteen sets of bellows supports. The drawings for injection and RF straight section doublet chambers have been checked and released. Protective caps for 8 and 10 " flanges have been received and 12" caps have been ordered.

Eight Type A chambers have been TiN coated. The lower limit in sputtering pressure has been determined. Too low a pressure results in poor adhesion. The coating stand has been re-worked to accommodate Types B-E chambers. The first Type B chamber is being coated. The TiN overlay on the Cu coated glass pipe was not successful. More development work will start soon on the production kicker pipes and RF cavity pipes. A paper on the coating of the injection kicker chambers was submitted to ICMCTF. Eight RF screens have been coated during the chamber sputtering, ready to be installed into the completed chambers.

The 1st article turbopump cart was inspected at vendor and will be shipped to BNL in April after correcting a few deficiencies. Agreement was reached with ORNL for gauge controller I/O function in the TMP Cart. Meetings on database and RGA interface were attended. The PLC input and output switch panels were wired and ready to be installed on the HEBT PLC rack. The beam tube ceramic breaks for HEBT, Ring and RTBT was reviewed in AP meeting.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
3498.5	3630.5	3890.4	132.01	3.8%	(259.9)	-7.2%

Variance Statement: Variances are within thresholds. No analysis required.

Current period CV -$357K (-237.2%) is driven by material ACWP ($284K) of Ring Vacuum Chamber, WBS 1.5. Current period cost variances will net out in cum in subsequent periods.

Project Impact: None.

Corrective Action: None.

WBS 1.5.6 – RF System

- Controls personnel continue work towards interfacing DSP modules with IOCs.
- Wall current monitor conceptual design finalized.
- Began design work on I/Q vector modulator.
- Generic VME carrier card nearly ready for first PCB prototype.

SNS Ring high level:

- Testing the PA without the dynamic tuning
- Integrating the new anode PS into the test set up.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
5030.4	5738.7	5284.3	708.28	14.1%	454.3	7.9%

Variance Statement: Cum schedule variance (SV) of $708.3K (14.1%) is driven by 1.5.6.1 High Level RF Systems. BCWP is overstated and will be adjusted in the next period. Current period CV of -$62.4K (-34%) is driven by 1.5.6.2 Low Level RF Systems purchases whereas actual material costs were greater than BCWP reported.

Project Impact: None.

Corrective Action: None.

WBS 1.5.7 – Ring Diagnostics

Group members submitted cabling information for all systems to ORNL.

BPM PUE deliveries have been on hold for the past month, as we complete the move of our lab space and get the production facility back into operation. Running total of delivery is 28 of the 21cm Ring and 2 of the 21 cm HEBT PUEs. Work continues on Ring and RTBT electronics conceptual design, based on the Linac/Bergoz AFE. We are investigating not only the possibility of switching the LO in the AFE to permit digitizing either 400MHz or baseband BPM signals from all PUEs, but also of looking at the excited signal of the tune system (see below). The possibility of using BPMs as clearing electrodes was investigated, with the conclusion that the +/- 1KV requested by AP can be applied to the existing hardware.

Conceptual design of a 'nestled' IPM is in progress. This design opens the magnet aperture to keep the detector completely out of the beam aperture and shielded by the vacuum chamber, and promises to greatly reduce problems with background due to beam loss and image currents. Work continues on prototype test of luminescence monitor in the AGS Ring. All parts are fabricated and ready for installation. Work on the optical IPM prototype (fluorescent screen in place of the MCP) is on hold in lieu of the luminescence monitor testing.

Both the new design and old design BLM ion chambers are now functional. A decision must now be made as to which design to use. A request to have a videoconference to discuss this subject has been made.

Craig Dawson visited LBNL and took part in the commissioning efforts in support of both the BCM and the Laser Wire. Testing went well. After repairing a shorted connector on one of the Berkeley toroids, both BCMs units are working, and the software has been upgraded to include two channel operation. There are noise problems which appear to grow out of ground loops, and it is recommended that all Berkeley connectors except one be floated. The rev 2 PCB art work has been completed and reviewed. BCM mechanical drawings have been forwarded to LANL for Mafia analysis.

UAL simulations of spectral response of beam kicked continuously during 1000 turn accumulation are now running, and refinements to this modeling of the transfer function measurement of the ring tune footprint are progressing. These simulations are also being utilized in refinement of the beam-in-gap system design. The possibility of providing an additional input to the BPM electronics to permit direct processing of the beam response by all Ring BPMs in addition to the resonant tune pickup is under investigation.

A repair kit for the MEBT Carbon Wire Scanners (carbon wire, springs, adhesive,...) was put together and shipped to Berkeley. Operation of the scanner mechanisms during MEBT commissioning has been without problems. Refurbishment of the spare wire scanner is in progress.

In addition to Craig Dawson, Roger Connolly and Sheng Peng of the BNL Controls group were at Berkeley for the successful commissioning of the MEBT laser wire. Remarkably good profiles

were obtained in short order. It was not possible to validate these measurements with the carbon wire scanners because of problems with correct bias of the carbon wires. Efforts to make the system more operator friendly are in progress. Access to the AGS Linac was gained for replacement of optics contaminated by local charge accumulation driven by the laser pulse, and the resulting pumping of ions from the vacuum onto the optics. A possible solution to this problem may be to have a thin conductive coating on the inner surface of the window. Dedicated beam time is scheduled for additional data acquisition at 200 MeV.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
5035.9	4920.4	5356.4	(115.50)	-2.3%	(436.1)	-8.9%

Variance Statement: Cum variances are within thresholds. No analysis required.

Current period schedule variance (SV) -$78.7K (-43.6%) is labor driven by 1.5.7.3 BLM Assy & Support and 1.5.7.6 Wire Scanner, whereas planned labor is greater than reported. Current period cost variance (CV) -$103.4K (-101.4%) is labor driven by 1.5.7.3 BLM Assy & Support and 1.5.7.6 Wire Scanner, whereas actual labor costs were greater than reported.

Project Impact: None.

Corrective Action: None.

WBS 1.5.8 – Collimation and Shielding

Work has started on the first scraper for the Ring. A meeting was held with instrument and controls staff to prepare an ICD covering all collimators and scrapers.

Drawings of the modified shield are complete. This work is being suspended until the HEBT collimator designs are complete.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
1556.2	1371.9	1353.2	(184.32)	-11.8%	18.7	1.4%

Variance Statement: Cum schedule variance (SV) of -$184,3K (-11.8%) is material driven by 1.5.8.1 Ring Collimator 1st delivery; and a current period SV -$190K (-87.2%) is also driven by WBS 1.5.8.1 Ring Collimator 1st delivery, whereas a PCR will be processed to show planned delivery in March ’03 thus adjusting SV.

Project Impact: None.

Corrective Action: None.

WBS 1.5.9 – Extraction System

The PFN and the prototype kicker magnet were tested at 35kV @ 60 Hz. There is still no indication of heating of the ferrite. The design of the quadrupole doublet stand and vacuum chamber and the configuration of the kicker modules were revised to move them as close as possible to the 30Q44/58 doublet assembly. Because of this, the BNL/SNS physics group was able to lower the kicker operating voltage to below 35 kV for all of the working points. The layout of the extraction region is being updated. The PFN test was successful. The cooling scheme of the PFN will use an oil pump to circulate the oil through a water-cooled heat exchanger. A pump station drawing will be added to the system drawing.

The Ceramic Magnetics delivery date for the low mu ferrite is still 4-5-02.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
1303.0	1280.4	1279.0	(22.62)	-1.7%	1.4	0.1%

Variance Statement: Variances are within thresholds. No analysis required.

Project Impact: None

Corrective Action: None.

WBS 1.5.10 – RTBT System

The 36Q80 magnet core is out for bid. Design work continues on the coil design and the coil winding fixtures. Another meeting was held at BNL with the engineering staff from ORNL. The topic of discussion was the design of the remotely removable vacuum clamps and the beam chambers (an ORNL responsibility at this time), interface to the final beam chamber before the window, and the beam line shielding between and before the quadrupoles. The tooling for the 36CD30 winding of a sample coil was completed and a sample winding of the corrector coil was completed and shown during the meeting with ORNL.

As the RTBT transfer line layout (magnets, instruments, collimators, etc.) is being finalized the vacuum system design, including magnet chambers and drift space spools, is being brought up to date. Design of the RTBT 21Q40 quadrupole/corrector/beam pipe/ion pump frame and stand is also underway.

Design work continues on the 27CD30 corrector dipole magnet that is used in both the RTBT and in the HEBT line with the 21Q40 quadrupoles. A design review was held with the ORNL engineering team. There were no issues.

The RTBT transfer line layout (magnets, instruments, fast valve, collimators, etc.) was reviewed and is being finalized. The vacuum system design, including magnet chambers and drift space spools, is being brought up to date. Linac dump window analysis and design concerns were presented during recent window review.

The manufacturing process for the first article is on schedule. Fabrication of the inner box for the first article has started. The final drawings of the second RTBT collimator are also complete.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
2341.9	2151.9	1986.6	(190.01)	-8.1%	165.3	7.7%

Variance Statement: Cum variances are within thresholds. No analysis required.

Current period SV of -$93.7K (-51.4%) is driven by WBS 1.5.10.5 RTBT Collimator 1st delivery; whereas a PCR will be processed to show planned delivery in March '03 thus adjusting SV.

Project Impact: None.

Corrective Action: None.

WBS 1.5.12 – Technical Support

- Finalization of the shape and dimensions of the beam pipe ring. The extraction kicker configuration has been finalized.
- The RTBT optics and the collimators were revised in view of the new kicker configurations and aperture restriction in the target region of the RTBT
- Global coordinates for the ring with new dipoles lengths were calculated.
- Study of the transverse coupling impedance of the displaced beam in the extraction kickers completed.
- Calculations of the coating thickness tolerance for the injection kickers ceramic vacuum chambers were finished.
- Numerical saturation studies on parallel cluster were finished.
- The studies of "envelope instability" in Rings were finished.
- The effect of sextupoles on non-linear motion and emittance growth were finished.
- Started collective instability studies using 3D space-charge routine.

- The fault studies of the ring and RTBT for the target requirement were started.

Variance Analysis (Cumulative to date) ($K)

BCWS	BCWP	ACWP	SV	%	CV	%
10363.3	10363.3	10149.8	0.00	0.0%	213.5	2.1%

Variance Statement: Variances are within thresholds. No analysis required.

Project Impact: None.

Corrective Action: None.

WBS 1.9.1 – R&D

WBS 1.9.2.2 – Global Timing

V124s
Heather has reviewed and corrected all know bugs. Updated files have been sent to ORNL. We are awaiting confirmation that all bugs have been eliminated.

Documentation of the V124s has been updated and is ready for signature in preparation for a 50 module production run.

V123s
The V123 bug of not passing on the interrupt acknowledge has been duplicated at BNL. We are actively working on a fix.

Eventlink Monitor
No Activity.

Eventlink fanout-
The revised schematic for the eventlink fanout has been generated. The PCB artwork has been created and quotes for a prototype pcb run has been received. The prototype order will be going out next week.

V206
The prototype V206, RTDL input module, is built and testing will begin next week.

WBS 1.9.2.2 –Timing Software

An Event timing slave and a prototype Utility board were received this month. The next step is to acquire or write drivers and test the boards in a typical application. In the next several weeks we

will be working on system integration of the Event timing, RTDL, Utility board, timing slave and IOC application software. Cables to distribute timing signals have been run between labs to prepare for system testing.

WBS 1.9.5.1 -Ring Controls Integration

Temperature monitoring devices with an Ethernet interface were received. A labview driver is available and was tested. The device was used to test the prototype BCM analog board for variations over temperature. A Vxworks/Epics driver is being written so this device can be used in beam dump, collimator and other IOCs.

Voltage source test:

Testing of the high resolution ADC boards requires an accurate voltage source. We found that our old source produced more noise for positive voltages than negative. This distorted some of our test results. We acquired and tested a newer voltage source. It is computer controlled, suitable for automatic testing of hardware and has lower noise output. A Labview driver was written for the new source and an automatic test system based on this source and a high precision HP3458a digital meter is being developed.

WBS 1.9.5.2 - Power Supply Controls

We met with Jeff Patton from ORNL to review our local database usage, and to establish requirements for the configuration database at ORNL. Jeff gathered information from the power supply and other groups on their database usage and requirements. Jeff will look into how database information used at BNL can be incorporated into the ORNL database.

Power Supply Test Application:

A portable Epics IOC was built that can be loaded and run from a Laptop. A Power Supply Application which can control or monitor up to 6 power supplies was developed and used to check out the power supply and power supply interface at the Booster Application Facility(BAF) at BNL. The first power supply using the SNS standard PS interface was delivered to BAF this month so it is the first power supply to be tested. A standalone PSC and test software written in Labview was also used to test the supply. The tests identified some configuration errors that have now been corrected.

IOC Rack Assignments:

Building layout drawings were acquired from ORNL for the HEBT Service Building and the RTBT Service Building. Rack assignments were completed for the Power Supply Control IOC's to be installed there. This completes the assignments for the last two of a total of nine IOC's. The information has been placed in an Excel spreadsheet, and a copy has been forwarded to Derrick Williams at ORNL for review.

Timing Board (124S) Driver:

The driver distribution package was received and is being installed on our server. We received a timing board and will start tests in the coming month.

CVS Procedures:

Procedures for checking out, revising and replacing application source code stored in the ORNL CVS repository was tested.

PSC/PSI Power Supply Testing at BNL

WBS 1.9.5.3 – Diagnostics

BLM:

We are using a circuit provided by the diagnostic group to determine if the ICS ADC boards can reliably detect low level BLM signals, in the 200 micro volt region. Epics drivers are being developed for the ADC boards. Software is being developed to measure and subtract out changes in the signal baseline.

BCM ADC Test:

An ADC test report was updated to include linearity, distribution, noise, temperature and repeatability tests. This report is available on the Web www.sns.bnl.gov To assist the diagnostics group in the selection of accurate digital meters we did an evaluation and comparison of the HP and Keithley meters.

WBS 1.9.5.4 - Vacuum

We participated in a presentation by the manufacturer of the RGA hardware that will be purchased.

WBS 1.9.5.5 - Application Software

Implemented the UAL-based application simulating Peter Cameron's tune measurement approach for the BNL/SNS diagnostics group.

The CVS repository for the UAL 1.x simulation environment (http://www.ual.bnl.gov/ual-cgi-bin/cvswebual1.cgi/) was created.
At this time, the repository contains the following modules.
- ZLIB (differential algebra)
- PAC (common accelerator objects shared by UAL applications)
- TEAPOT (symplectic integrator, collection of correction algorithms)
- ALE extensions:
    - User shell
    - Parser of MAD files
    - Parser of SXF (Standard eXchange Format) files

Integrated TEAPOT extensions implemented by the RHIC team for commissioning applications, such as:
- First turn injection
- Sliding bumps correction approach
- Global decoupling approach

WBS 1.9.5.6 – RF

The HLRF ICD was approved. For the LLRF we are obtaining modified MVME2100 CPU software from ORNL to test the CPU to PMC interface. The RF group purchased a PMC format DSP board. ORNL built and tested MVME2100 to PMC interface software as part of the MPS system.

IV. Earned Value Reports and Charts

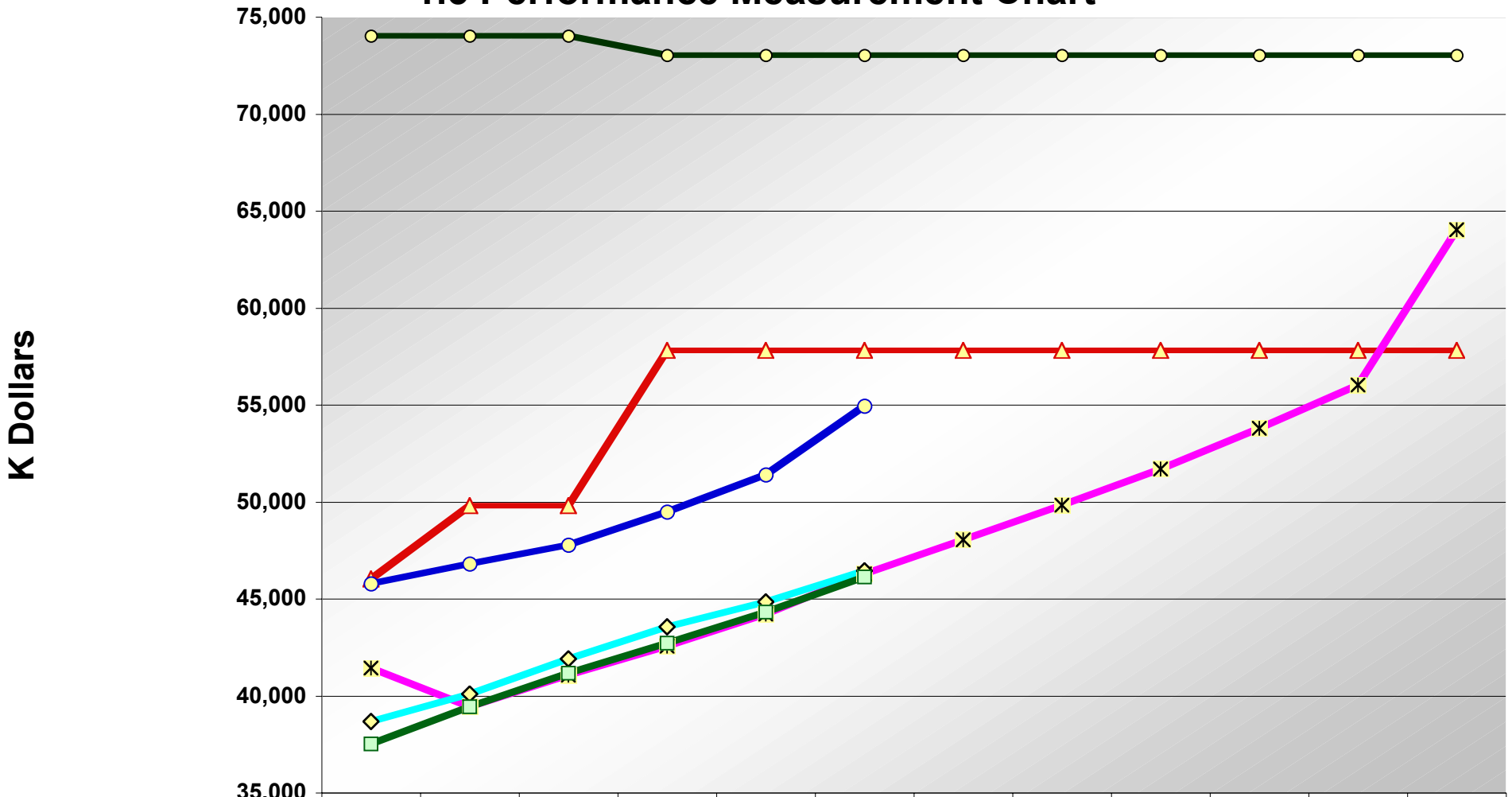
U.S. DEPARTMENT OF ENERGY
COST PERFORMANCE REPORT - WORK BREAKDOWN STRUCTURE (FORMAT 1)

PROJECT TITLE: SPALLATION NEUTRON SOURCE	**REPORTING PERIOD:** 1-Mar-02 thru 31-Mar-02	**PROJECT NUMBER:** 99-E-334
		START DATE: October 1998
PARTICIPANT NAME AND ADDRESS: Brookhaven National Laboratory Brookhaven, NY	**BCWS PLAN DATE:** October 1999	**COMPLETION DATE:** November 2006

WORK BREAKDOWN STRUCTURE	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	Budgeted Cost		Actual Cost of Work Performed	Variance		Budgeted Cost		Actual Cost of Work Performed	Variance				
	Work Scheduled	Work Performed		Schedule	Cost	Work Scheduled	Work Performed		Schedule	Cost	Budgeted	Revised Estimate	Variance
1.1.3 Rings System Development	7.7	7.7	0.05	0.0	7.7	5,068.2	5,068.2	5,083.3	0.0	(15.1)	5,115	5,115	0.0
1.5 Ring & Transfer Line System	2,075.8	1,593.5	1,814.4	(482.3)	(220.9)	46,287.6	46,433.2	46,140.4	145.6	292.8	112,965	112,965	0.0
1.5.1 HEBT (High Energy Beam Transport) Systems	388.7	198.1	79.2	(190.6)	118.9	4,231.0	4,060.0	3,822.3	(171.0)	237.7	10,174	10,174	0.0
1.5.2 Injection Systems	150.2	148.4	104.5	(1.9)	43.8	3,341.4	3,493.4	3,505.8	152.0	(12.4)	9,013	9,013	0.0
1.5.3 Magnet Systems	233.3	317.12	232.5	83.8	84.6	8,705.5	8,540.0	8,628.2	(165.4)	(88.1)	16,621	16,621	0.0
1.5.4 Power Supply System	13.9	14.4	20.3	0.5	(5.9)	879.8	882.0	883.6	2.2	(1.6)	3,434	3,434	0.0
1.5.5 Vacuum System	152.7	150.5	507.6	(2.2)	(357.0)	3,498.5	3,630.5	3,890.4	132.0	(259.9)	9,759	9,759	0.0
1.5.6 RF System	181.9	183.4	245.7	1.5	(62.4)	5,030.4	5,738.7	5,284.3	708.3	454.3	12,132	12,132	0.0
1.5.7 Ring Systems Diagnostic Instrumentation	180.7	101.9	205.3	(78.7)	(103.4)	5,035.9	4,920.4	5,356.4	(115.5)	(436.1)	14,410	14,410	0.0
1.5.8 Collimation and Shielding	217.8	27.8	22.8	(190.0)	5.0	1,556.2	1,371.9	1,353.2	(184.3)	18.7	3,429	3,429	0.0
1.5.9 Extraction System	62.1	51.0	56.4	(11.1)	(5.4)	1,303.0	1,280.4	1,279.0	(22.6)	1.4	6,169	6,169	0.0
1.5.10 RTBT (Ring to Target Beam Transport) System	182.1	88.5	90.8	(93.7)	(2.3)	2,341.9	2,151.9	1,986.6	(190.0)	165.3	7,487	7,487	0.0
1.5.11 Cable	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.0	0.0	0.7	0.7	0.0
1.5.12 Technical Support	312.4	312.4	249.3	0.0	63.1	10,363.3	10,363.3	10,149.8	0.0	213.5	20,337	20,337	0.0
WBS SUBTOTAL	2,083.5	1,601.2	1,814.4	(482.3)	(213.2)	51,355.8	51,501.4	51,223.7	145.6	277.6	118,080		
UNDISTRIBUTED BUDGET													
SUBTOTAL	2,083.5		1,814.4			51,355.8		51,223.7			118,080		
MANAGEMENT RESERVE													
TOTAL	2,083.5		1,814.4			51,355.8		51,223.7			118,080		
RECONCILIATION TO CONTRACT BUDGET BASE													

DOLLARS EXPRESSED IN: THOUSANDS	SIGNATURE OF PARTICIPANT'S PROJECT DIRECTOR: Jie Wei	DATE: March 19, 2002

1.5 Performance Measurement Chart



	Oct-01	Nov	Dec	Jan-02	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Cum Planned BA	74,034	74,034	74,034	73,034	73,034	73,034	73,034	73,034	73,034	73,034	73,034	73,034
Cum Authorized BA	46,034	49,806	49,806	57,806	57,806	57,806	57,806	57,806	57,806	57,806	57,806	57,806
Cum Actual BA	45,796	46,801	47,788	49,500	51,402	54,943						
Cum BCWS	41,443	39,429	41,061	42,563	44,212	46,288	48,045	49,821	51,685	53,793	56,022	64,040
Cum BCWP	38,670	40,079	41,914	43,553	44,840	46,433						
Cum ACWP	37,521	39,429	41,181	42,722	44,326	46,140						

Months